

Quantifying Event Location

Proposal to make the criteria for event location more objective.

This has become more important in Phase 2 since there is a significant number of events with low primary multiplicity.

One and two track vertices are **not** background free.

There are also a small number of emulsion vertices that do not seem to match spectrometer information.

We should quantify "matching" of emulsion to electronic data.

Useful Information

1. Probability of vertex being a background
 - 1.1 Random association
 - 1.2 Not associated with SFT info
2. Emulsion tracks matched to SFT tracks
 - 2.1 Number of matched tracks
 - 2.2 Probability of random matching
 - 2.3 Muon ID and match
3. Emulsion tracks matched to Calorimeter clusters
 - 3.1 Number of matched tracks
 - 3.2 Probability of random matching

Criteria

1.1 Tracks within $5 \mu\text{m}$

1.2 Tracks angle $< 200 \text{ mr}$

2.1 Emulsion - SFT angle $\sigma = 5 \text{ mr} \oplus \sigma_{\text{MS}}$,
 where $\sigma_{\text{MS}} \equiv 14 \left(\frac{\theta}{0.3} \right) \sqrt{x} \text{ mr}$

2.2 Muon ID hits ≥ 4

3.1 Emulsion - Ecal position @ Ecal $\sigma = 5 \text{ cm}$

3.2 Ecal cluster $E_{\text{clus}} > 10 \text{ GeV}$

Color key:

reasonable

uncertain

needs MC study

Implementation

1.1 Need densities of stopping tracks in location volume

1.2 Need densities of random vertices in location volume

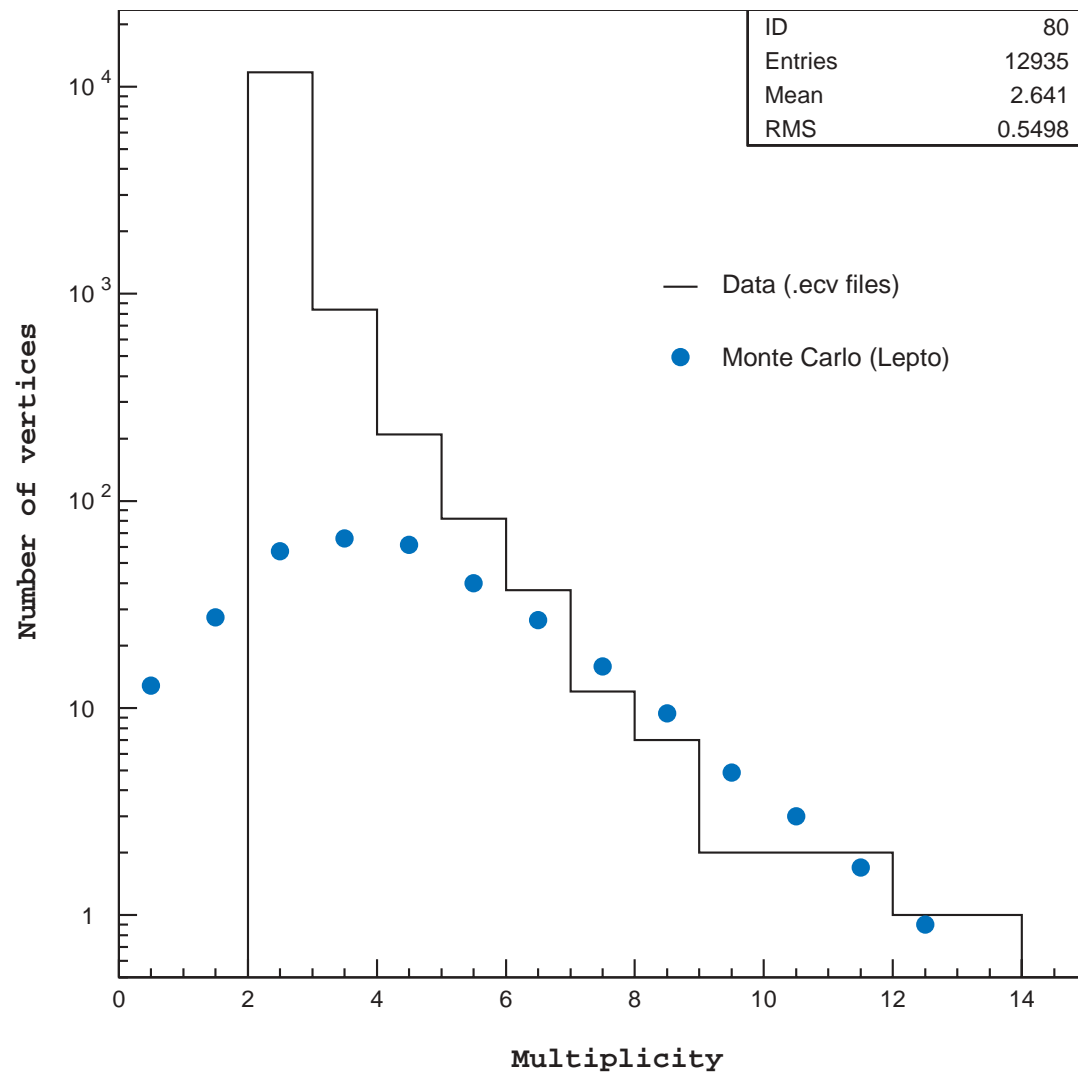
2.1 Determine $\Delta\theta_{\text{SFT}}^{\text{sig}}/\sigma$ for all emulsion tracks

2.2 Randomly rotate emulsion tracks in ϕ , find $\Delta\theta_{\text{SFT}}^{\text{bkg}}/\sigma$

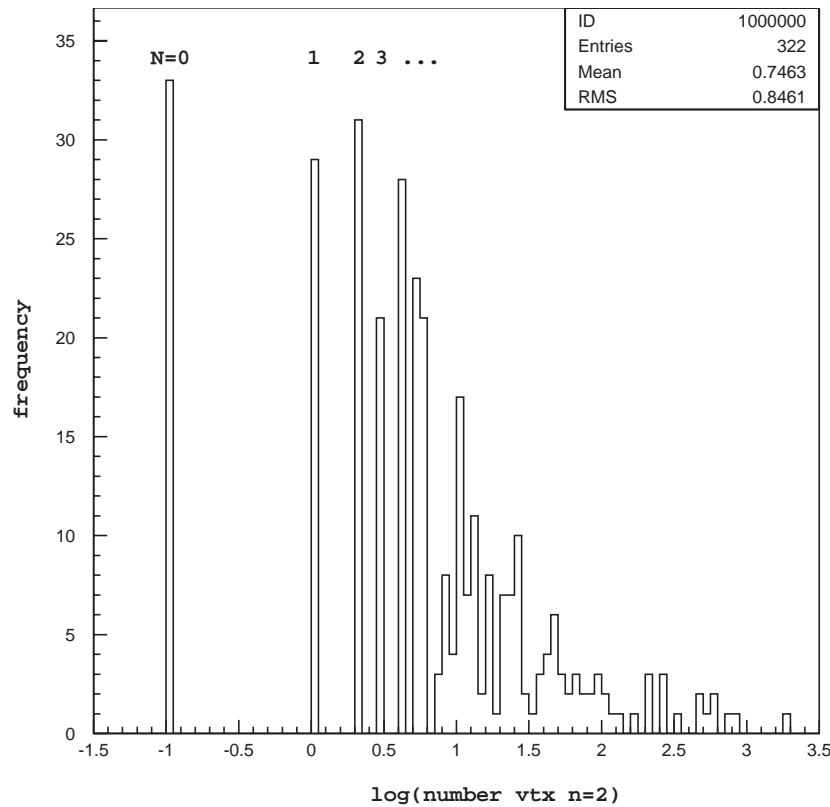
3.1 Determine $\Delta r_{\text{SFT}}^{\text{sig}}/\sigma$

3.2 Randomly rotate emulsion tracks in ϕ , find $\Delta r_{\text{SFT}}^{\text{bkg}}/\sigma$

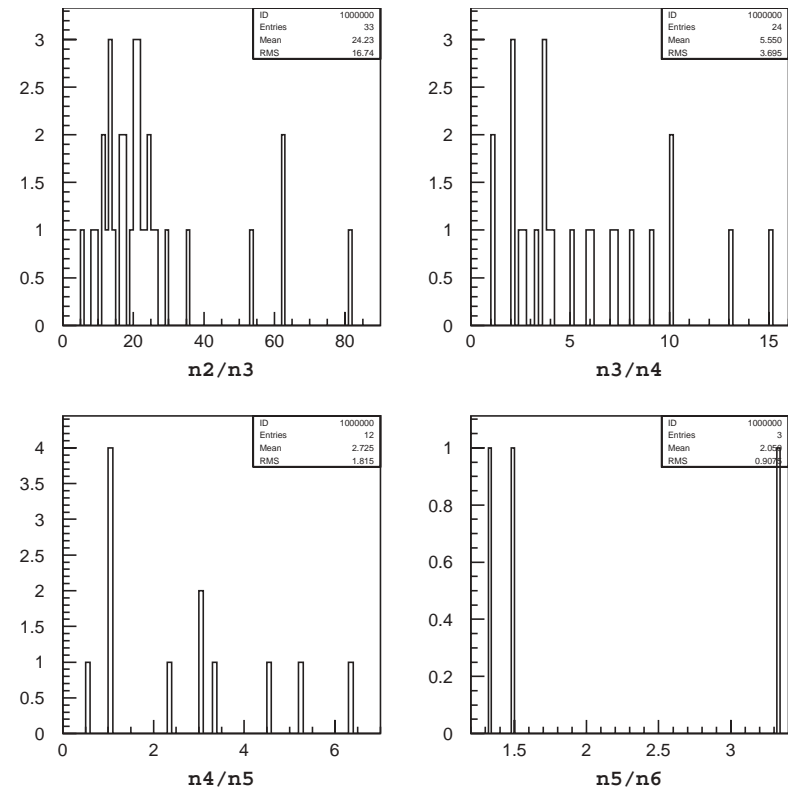
Find "Total" sig/bkg from $1 \oplus 2 \oplus 3$;
(weighted with significance?)



Multiplicity of all vertices from .ecv files compared with MC predicted multiplicity.



For the located events, the number of 2-track vertices is shown. Much more valuable would be the above data vs. located vtx multiplicity.



For located events, the ratio of n -track vertices to $(n+1)$ -track vtx, for $n=2,3,4,5$. This is essentially the same information shown in first plot but ratio is event-by-event.

4 Mar 2005

Lundberg - Objective Location